NASA/TM-1999-208641/VER4/VOL2

ICESat (GLAS) Science Processing Software Document Series

Volume 2

Science Data Management Plan

Version 4.0

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July 1999

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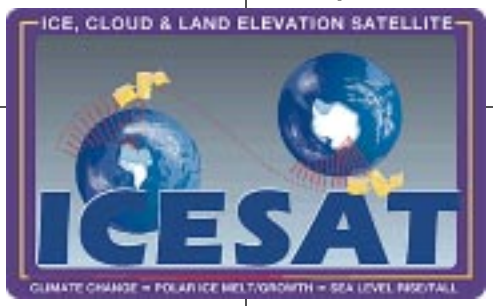

Foreword

This document addresses the Data Management aspects of the GLAS Standard Data Software supporting the GLAS instrument on the EOS ICESat (Ice, Cloud, and Land Elevation Satellite) Spacecraft. The Standard Data Software will produce Level 0, Level 1A, Level 1B, and Level 2 data products as well as the associated product quality assessments. For the Instrument Support Facility (ISF), the Standard Data Software will accommodate the GLAS instrument support areas of engineering status, command, performance assessment, and instrument health status.

The term "Standard Data Products" refers to those EOS instrument data products listed in the Earth Science Data and Information System (ESDIS) Project data base that are routinely generated within the EOSDIS Distributed Active Archive Center (DAAC) or Science Computing Facilities (SCFs). Each data product has a unique Product Identification code assigned. These data products will have been physically generated as a collection of EOS data parameters in a product aggregate or file. Data parameters will be retrievable from the DAAC. Data parameters are composed of GLAS elements, i.e., data items and arrays of items. The arrays and data items consist of measured or derived instrument values.

The term "ancillary data file" indicates an external data file or an internally-generated data file that is to be used in the production of standard GLAS data products. The external ancillary data files will be obtained either through the DAAC or other designated sources. These files will be delivered to the DAAC or GLAS SCF for GLAS data production.

The term "instrument support file" indicates a file that is used or generated by the ISF Software in order to perform mission operations.

This document was prepared by the Observational Science Branch at NASA GSFC/WFF, Wallops Island, VA, in support of Bob E. Schutz, GLAS Science Team Leader for the GLAS Investigation. This work was performed under the direction of David W. Hancock, III, who may be contacted at (757) 824-1238, hancock@osb.wff.nasa.gov (e-mail), or (757) 824-1036 (FAX).

Table of Contents

Foreword iii
Table of Contents v
List of Figures vii
List of Tables ix

Section 1 Introduction

1.1 Identification of Document 1-1
1.2 Scope of Document 1-1
1.3 Purpose and Objectives of Document 1-5
1.4 Document Status and Schedule 1-6
1.5 Document Organization 1-6

Section 2 Related Documentation

2.1 Parent Documents 2-1
2.2 Applicable Documents 2-1
2.3 Information Documents 2-2

Section 3 System Descriptions

3.1 Standard Data Software 3-1
3.2 Technical Interfaces 3-4
3.3 Interface Controls 3-6
3.4 Configuration Management 3-7
3.5 Quality Assurance 3-7

Section 4 GLAS Standard Data Products

4.1 GLAS Production Data Sets (GLA00) 4-2
4.2 GLAS Rate Buffered Data File (GLA00) 4-3
4.3 GLAS Instrument Packet File 4-3
4.4 Level 1A Data Product Files (GLA01, GLA02, GLA03, GLA04) 4-4
4.5 Waveform-based Range Corrections File (GLA05) 4-5
4.6 Elevation File (GLA06) 4-5
4.7 Backscatter File (GLA07) 4-6
4.8 Boundary Layer Height File (GLA08) 4-7
4.9 Cloud Height for Multiple Layers File (GLA09) 4-7
4.10 Aerosol Vertical Structure File (GLA10) 4-8
4.11 Thin Cloud/Aerosol Optical Depth File (GLA11) 4-9

4.12 Level 2 Elevation Data Product Files (GLA12, GLA13, GLA14, GLA15) 4-9

Section 5 Ancillary Data

5.1 Meteorological Data File (GLA ANC 01). 5-2
5.2 Laser Tracking Data File (GLA ANC 03) 5-3
5.3 IERS Polar Motion and Earth Rotation Data File (GLA ANC 04). 5-4
5.4 Magnetic and Solar Flux Data File (GLA ANC 05) 5-4
5.5 GLAS Metadata and Data Product Quality File (GLA ANC 06). 5-5
5.6 GLAS Coefficients and Constants File (GLA ANC 07). 5-6
5.7 Precision Orbit Data File (GLA ANC 08) 5-7
5.8 Precision Attitude Data File (GLA ANC 09). 5-8
5.9 GPS Tracking Data File (GLA ANC 10) 5-8
5.10 Other Data (Miscellaneous) Files (GLA ANC 11). 5-9
5.11 Digital Elevation Model (GLA ANC 12) 5-10
5.12 Geoid File (GLA ANC 13). 5-11
5.13 Pole Tide Model File (GLA ANC 14) 5-11
5.14 Earth Tide Model File (GLA ANC 15). 5-12
5.15 Load Tide Model File (GLA ANC 16). 5-12
5.16 Ocean Tide Model File (GLA ANC 17). 5-13
5.17 Surface Type Class File (GLA ANC 19). 5-13

Section 6 Instrument Support Files

6.1 GLAS Baseline Activity Plan (GLA SUP 01) 6-2
6.2 Uplink and Downlink Schedules (GLA SUP 02). 6-2
6.3 GLAS Housekeeping and Status Packets (GLA SUP 03). 6-3
6.4 Instrument Command Blocks (GLA SUP 04) 6-3
6.5 Spacecraft Command Sequences (GLA SUP 05). 6-4
6.6 Predicted Events Files (GLA SUP 06). 6-4
6.7 Spacecraft Flight Operations Schedule (GLA SUP 07) 6-5
6.8 Spacecraft Ephemeris Data Files (GLA SUP 08) 6-5
6.9 Telemetry Data Requests (GLA SUP 09) 6-6
6.10 Status Reports (GLA SUP 10) 6-6
6.11 Instrument Performance Trend Files (GLA SUP 11). 6-7
6.12 Event Log File (GLA SUP 12) 6-7
6.13 GLAS Command Requests (GLA SUP 13) 6-8

Appendix A File Formats

Abbreviations & Acronyms. AB-1
Glossary. GL-1

List of Figures

Figure 3-1 The I-SIPS Software Data Flow 3-6

List of Tables

Table 1-1 GLAS File Description Table 1-2

Table 3-1 Data Interface Control Organizations 3-2

Table 4-1 GLAS Standard Data Products Volume and Frequency 4-1

Table 5-1 GLAS Ancillary Data Products Volume and Frequency 5-1

Table 6-1 GLAS Instrument Support Data Products Volume and Frequency 6-1

Table A-1 Content and Format of the Meteorological Data File (GLA ANC 01) A-1

Table A-2 Content and Format of the Laser Tracking Data File (GLA ANC 03) A-1

Table A-3 Content and Format of the IERS Polar Motion and Earth Rotation Data File (GLA ANC 04) A-1

Table A-4 Content and Format of the Magnetic and Solar Flux Data File (GLA ANC 05) A-1

Table A-5 Content and Format of the GLAS Metadata and Data Product Quality Data File (GLA ANC 06) A-1

Table A-6 Content and Format of the GLAS Coefficients and Constants ESDIS File (GLA ANC 07) A-1

Table A-7 Content and Format of the Precision Orbit Data File (GLA ANC 08) A-1

Table A-8 Content and Format of the Precision Attitude Data File (GLA ANC 09) A-2

Table A-9 Content and Format of the GPS Tracking Data File (GLA ANC 10) A-2

Table A-10 Content and Format of the Miscellaneous Data File (GLA ANC 11) A-2

Table A-11 Content and Format of the Digital Elevation Model File (GLA ANC 12) A-2

Table A-12 Content and Format of the Geoid File (GLA ANC 13) A-2

Table A-13 Content and Format of the Pole Tide Model File (GLA ANC 14) A-2

Table A-14 Content and Format of the Earth Tide Model File (GLA ANC 15) A-2

Table A-15 Content and Format of the Load Tide Model File (GLA ANC 16) A-2
Table A-16 Content and Format of the Ocean Tide Model File (GLA ANC 17) A-3
Table A-17 Content and Format of the Surface Type Class File (GLA ANC 19) A-3

Section 1

Introduction

1.1 Identification of Document

This document is identified as the GLAS Science Data Management Plan. The unique document identification number within the GLAS Ground Data System numbering scheme is GLAS-DMP-1200. Successive editions of this document will be uniquely identified by the cover and page date marks.

1.2 Scope of Document

This document identifies and describes the GLAS Standard Data Products, Instrument Support Facility data, and the GLAS Ancillary Data. This document identifies the controlling authority for each of the files and products and the interface for retrieval or delivery of the data.

The interface aspect is primarily directed toward the generating software system, and the recipient destination software nodes associated with each data file. For ancillary files, the source is defined as the location or system from which the file is obtained for GLAS standard data product generation. The actual generation method of the ancillary files and all locations where they may reside are not discussed. The data files are identified in Table 1-1 “GLAS File Description Table”. The data files listed in Table 1-1 include the GLAS standard data products, internal data products, instrument operations support files, and ancillary data files. The standard data products are those products delivered to the NSIDC DAAC for archival and distribution; these files are in Hierarchical Data Format (HDF) / HDF-EOS. The internal data products are the standard data products prior to applying HDF / HDF-EOS. The internal data products are not described separately in this document since these files have the same content as the standard data products and the files are not distributed outside the GLAS investigation. The internal data products will be archived for a period of time at the GLAS SCF. The columns in Table 1-1 have the following meanings:

- File ID - file identifier applied by the GLAS investigation
- File Name - the name of the file
- SPSO Equivalent - the EOS product identifier
- Archive Site - the facility that will archive the data
- File Disposition - an EOS usage indicator with the following definitions:
    - Archive - a file that is permanently archived after it is created
    - Interim - a file that is created for use by a subsequent process, but is not archived

  - Permanent - a file that is assumed to be kept in the processing environment for repeated access by one or more processes (the file is probably backed up in the archive)
  - Temporary - a file that is created by a process during its execution, and is then deleted after termination (e.g., a scratch file)
  - Transfer to SCF - similar to an Interim file, except the process that uses it is at an SCF (hence the need to transfer it there); typically this is the output of an automated QA process
- Source - the facility that is generating or providing the data.

Table 1-1 GLAS File Description Table

File ID	File Name	SPSO Equivalent	Archive Site	File Disposition	Source
GLA00	GLAS Production Data Sets	GLA00	NSIDC	archive	EDOS
GLA00	GLAS Rate Buffered Data Files	GLA00	NSIDC	archive	EDOS
n/a	GLAS Instrument Packet File	n/a	n/a	permanent	ICESat SCF
GLA01	Altimetry Data File	GLA01	NSIDC	archive	ICESat SCF
GLA01_SCF	Altimetry Data File	n/a	n/a	permanent	ICESat SCF
GLA02	Atmosphere Data File	GLA02	NSIDC	archive	ICESat SCF
GLA02_SCF	Atmosphere Data File	n/a	n/a	permanent	ICESat SCF
GLA03	Engineering Data File	GLA03	NSIDC	archive	ICESat SCF
GLA03_SCF	Engineering Data File	n/a	n/a	permanent	ICESat SCF
GLA04	SRS and GPS Data File	GLA04	NSIDC	archive	ICESat SCF
GLA04_SCF	SRS and GPS Data File	n/a	n/a	permanent	ICESat SCF
GLA05	Waveform-based Range Corrections File	GLA05	NSIDC	archive	ICESat SCF

n/a - not applicable
ST - Science Team

Table 1-1 GLAS File Description Table (Continued)

File ID	File Name	SPSO Equivalent	Archive Site	File Disposition	Source
GLA05_SCF	Waveform-based Range Corrections File	n/a	n/a	permanent	ICESat SCF
GLA06	Elevation File	GLA06	NSIDC	archive	ICESat SCF
GLA06_SCF	Elevation File	n/a	n/a	permanent	ICESat SCF
GLA07	Backscatter File	GLA07	NSIDC	archive	ICESat SCF
GLA07_SCF	Backscatter File	n/a	n/a	permanent	ICESat SCF
GLA08	Boundary Layer and Elevated Aerosol Layer Heights File	GLA08	NSIDC	archive	ICESat SCF
GLA08_SCF	Boundary Layer Height File	n/a	n/a	permanent	ICESat SCF
GLA09	Cloud Height for Multiple Layers File	GLA09	NSIDC	archive	ICESat SCF
GLA09_SCF	Cloud Height for Multiple Layers File	n/a	n/a	permanent	ICESat SCF
GLA10	Aerosol Vertical Structure File	GLA10	NSIDC	archive	ICESAT SCF
GLA10_SCF	Aerosol Vertical Structure File	n/a	n/a	permanent	ICESat SCF
GLA11	Thin Cloud/Aerosol Optical Depth File	GLA11	NSIDC	archive	ICESat SCF
GLA11_SCF	Thin Cloud/Aerosol Optical Depth File	n/a	n/a	permanent	ICESat SCF
GLA12	Ice Sheet Products File	GLA12	NSIDC	archive	ICESat SCF
GLA12_SCF	Ice Sheet Products File	n/a	n/a	permanent	ICESat SCF
GLA13	Sea Ice Products File	GLA13	NSIDC	archive	ICESat SCF
GLA13_SCF	Sea Ice Products File	n/a	n/a	permanent	ICESat SCF

n/a - not applicable
ST - Science Team

Table 1-1 GLAS File Description Table (Continued)

File ID	File Name	SPSO Equivalent	Archive Site	File Disposition	Source
GLA14	Land Products File	GLA14	NSIDC	archive	ICESat SCF
GLA14_SCF	Land Products File	n/a	n/a	permanent	ICESat SCF
GLA15	Ocean Products File	GLA15	NSIDC	archive	ICESat SCF
GLA15_SCF	Ocean Products File	n/a	n/a	permanent	ICESat SCF
GLA ANC 01	Meteorological Data File	n/a	n/a	interim	GSFC DAAC
GLA ANC 03	Laser Tracking Data File	n/a	n/a	interim	CDDIS
GLA ANC 04	IERS Polar Motion and Earth Rotation Data File	n/a	n/a	interim	UTCSR
GLA ANC 05	Magnetic and Solar Flux Data File	n/a	n/a	interim	NOAA
GLA ANC 06	GLAS Metadata and Data Product Quality Data File	n/a	NSIDC	archive	ICESat SCF
GLA ANC 06_SCF	GLAS Metadata and Data Product Quality Data File	n/a	n/a	permanent	ICESat SCF
GLA ANC 07	GLAS Coefficients and Constants File	n/a	n/a	permanent	ICESat SCF
GLA ANC 08	Precision Orbit Data File	n/a	NSIDC	archive	ICESat SCF
GLA ANC 09	Precision Attitude Data File	n/a	NSIDC	archive	ICESat SCF
GLA ANC 10	GPS Tracking Data File	n/a	n/a	permanent	CDDIS
GLA ANC 11	Miscellaneous Data File	n/a	n/a	permanent	UTCSR
GLA ANC 12	Digital Elevation Model	n/a	n/a	permanent	GLAS ST
GLA ANC 13	Geoid File	n/a	n/a	permanent	GLAS ST
GLA ANC 14	Pole Tide Model File	n/a	n/a	permanent	GLAS ST
GLA ANC 15	Earth Tide Model File	n/a	n/a	permanent	GLAS ST
GLA ANC 16	Load Tide Model File	n/a	n/a	permanent	GLAS ST
GLA ANC 17	Ocean Tide Model File	n/a	n/a	permanent	GLAS ST

n/a - not applicable
ST - Science Team

Table 1-1 GLAS File Description Table (Continued)

File ID	File Name	SPSO Equivalent	Archive Site	File Disposition	Source
GLA ANC 19	Surface Type Class File	n/a	n/a	permanent	GLAS ST
GLA SUP 01	GLAS Baseline Activity Plan	n/a	GLAS ISF	archive	GLAS IOT
GLA SUP 02	Uplink and Downlink Schedules	n/a	GLAS ISF	archive	MOC
GLA SUP 03	GLAS Housekeeping and Status Packets	n/a	GLAS ISF	archive	MOC
GLA SUP 04	Instrument Command Blocks	n/a	GLAS ISF	archive	MOC
GLA SUP 05	Spacecraft Command Sequences	n/a	GLAS ISF	archive	MOC
GLA SUP 06	Predicted Events File	n/a	GLAS ISF	archive	MOC
GLA SUP 07	Spacecraft Flight Operations Schedule	n/a	GLAS ISF	archive	MOC
GLA SUP 08	Spacecraft Ephemeris Data Files	n/a	GLAS ISF	archive	MOC
GLA SUP 09	Telemetry Data Requests	n/a	GLAS ISF	archive	GLAS IOT
GLA SUP 10	Status Reports	n/a	GLAS ISF	archive	GLAS IOT
GLA SUP 11	Instrument Performance Trend Files	n/a	GLAS ISF	archive	GLAS IOT
GLA SUP 12	Event Log File	n/a	GLAS ISF	archive	MOC
GLA SUP 13	GLAS Command Requests	n/a	GLAS ISF	archive	GLAS IOT

n/a - not applicable
ST - Science Team

The GLAS Data Product levels are defined in the GLAS Science Software Management Plan (Parent Document 2.1b).

This data management document specifically avoids the human or “peopleware” interface considerations. The intended audience for this document is the GLAS Science and Instrument Teams, the ESDIS Project, and the community of EOS data users and investigators.

1.3 Purpose and Objectives of Document

The purpose of the GLAS Science Data Management Plan Document is to provide a descriptive document for the GLAS standard science data product files, instrument

support files, and ancillary files as well as their associated interfaces. This document briefly describes the purpose, content, format, source, destination, and the control authority of the GLAS Standard Science Data Products, Instrument Support Files, and ancillary data files.

1.4 Document Status and Schedule

The GLAS Science Data Management Plan is currently being issued as Version 4.0.

1.5 Document Organization

This document's outline is assembled in a form similar to those presented in the NASA Software Engineering Program [Information Document 2.3a].

1.5.1 Items to be Resolved

1) Content of the IERS Polar Motion and Earth Rotation Data File (GLA ANC 04) needs to be verified.
2) Content of the NOAA/CMDL Magnetic and Solar Flux Data File (GLA ANC 05) needs to be verified.
3) The format of the externally-generated input files are TBD, and need to be mutually agreed upon with the source agencies.
4) The GLA ANC 12 - GLA ANC 19 (DEM, GEOID, the four Tide Models, Surface Type) need to be better defined.
5) The Instrument Support Files need better definition.

1.5.2 Document Change History

Document Name: GLAS Science Data Management Plan		
Version Number	**Date**	**Nature of Change**
Preliminary	December 31, 1995	Original Version
Updated Preliminary	December 31, 1996	
Version 2.2	July 1998	Updated the terminology and processes.
Version 3.0	August 1998	Minor fixes to Version 2.2; change bars removed.
Version 4.0	July1999	Updated telemetry data descriptions and tables; minor text changes

Section 2

Related Documentation

2.1 Parent Documents

The GLAS Science Data Management Plan represents a data description that is a roll-out from the GLAS Science Software Management Plan as the parent document. Specific topics pertaining to data descriptions are located in the Interface Control Plan section under the Development Activities Plan template, NASA-DID-M200.

This document is subordinate to any top-level mission or instrument management plan documents. The recognized external ESDIS and GLAS parent documents superior to the GLAS Science Data Management Plan are listed below.

a) *NASA Earth Observing System Geoscience Laser Altimeter System GLAS Science Requirements Document,* Version 2.01, October 1997, Center for Space Research, University of Texas at Austin.

b) *GLAS Science Software Management Plan*, Version 3.0, August 1998, NASA Goddard Space Flight Center, Wallops Flight Facility.

2.2 Applicable Documents

The following documents are related to, or contain policies or references pertinent to the contents of the GLAS Science Data Management Plan.

a) *GLAS Standard Data Products Specification - Level 1*, Version 2.0, December 1998, NASA Goddard Space Flight Center, Wallops Flight Facility.

b) *GLAS Standard Data Products Specification - Level 2*, Version 2.0, December 1998, NASA Goddard Space Flight Center, Wallops Flight Facility.

c) *GLAS Level 0 Instrument Data product Specification,* Version 2.2, March 1998, NASA Goddard Space Flight Center, Wallops Flight Facility.

d) *Interface Control Document Between the Earth Observing System (EOS) Data and Operations System (EDOS) and EOS Ground System (EGS) Elements,* EDOS Document CDRL B301, June 1999, Goddard Space Flight Center.

e) *Interface Control Document Between the EOSDIS Core System (ECS) and the Science Investigator-Led Processing Systems (SIPS)*, ESDIS Document 423-41-57, December 1998, NASA Goddard Space Flight Center.

f) *Mission Operations Requirements Document for the Ice, Cloud, and Land Elevation Satellite*, ICES-401-SPEC-002, Version 1.1, May 1999, NASA Goddard Space Flight Center.

2.3 Information Documents

The following documents are provided as sources of information that provide background or supplemental information that may clarify or amplify material in the GLAS Science Data Management Plan.

a) *NASA Software Documentation Standard Software Engineering Program*, NASA, NASA-STD-21000-91, July 29, 1991.

b) *The Geoscience Laser Altimetry/Ranging System*, IEEE Transactions on Geoscience and Remote Sensing, Vol. GE-25, No. 5, September 1987.

c) *EOS Altimetry/GLAS Phase-A Study*, NASA Goddard Space Flight Center, November 1995.

d) *Memorandum: GLAS Data Products*, Center for Space Research, University of Texas at Austin, December 23, 1993.

e) *Science User's Guide and Operations Procedure Handbook for the ECS Project, Vol. 4: Software Developer's Guide to Preparation, Delivery, Integration and Test with ECS*, Hughes Information Technology Corporation, August 1995, 205-CD-002-002.

f) *GLAS Science Software Architectural Design Document*, Version 2.0, October 1998, NASA Goddard Space Flight Center, Wallops Flight Facility.

g) *Precision Orbit Determination (POD),* Algorithm Theoretical Basis Document, Version 0.1, December 1996, Center for Space Research, The University of Texas at Austin.

h) *Precision Attitude Determination (PAD)*, Algorithm Theoretical Basis Document, December 1996, Center for Space Research, The University of Texas at Austin.

i) *GLAS Science Computing Facility (SCF) Plan,* NASA Goddard Space Flight Center, Wallops Flight Facility, February 1998.

j) *Atmospheric Delay Correction to GLAS Laser Altimeter Ranges,* Algorithm Theoretical Basis Document, Version 0.3, December 1996, Massachusetts Institute of Technology.

Section 3

System Descriptions

This section provides, with respect to the GLAS standard data product generation, a description of the GLAS Standard Data Software, its technical interfaces, and the interface control.

3.1 Standard Data Software

The GLAS Standard Data Software (SDS) is the system which provides data processing and mission support for the GLAS Investigation. The SDS is composed of the ICESat Science Investigator-led Processing System (I-SIPS) and the Instrument Support Facility (ISF) System. The I-SIPS includes the software and operations which produce the GLAS standard data products and their metadata. The ISF System includes the GLAS instrument health assessment, instrument commanding, and other functions required for mission support. This document is concerned with the files required or produced by the GLAS Standard Data Software. These files and their control authority are listed in Table 3-1 "Data Interface Control Organizations" on page 3-2. The control authority is the organization that is responsible for the quality and integrity of the file at its source or archive destination. Also defined in Table 3-1 is the SDS system requiring the data for input or generating the data. Included in Table 3-1 are the GLAS internal data products (identified with _SCF in the ID). The source and destination of each of the I-SIPS files are depicted in Figure 3-1 "The I-SIPS Software Data Flow" on page 3-6.

The GLAS I-SIPS performs the following functions:

- obtain/create input data
- execute standard product generation algorithms to create the standard data products
- store data products
- deliver HDF / HDF-EOS data products to the DAAC
- deliver the GLAS internal (non-HDF(-EOS)) data products to the GLAS SCF
- assess data product for quality and content, and produce metadata
- report results

The input data to the I-SIPS Software is lower level data products (in the internal format) and ancillary files. The ancillary files will be either obtained from sources external to GLAS or will be generated by the GLAS Science Team. The responsible parties for each file both at their source and destination are defined in Sections 4 and 5. Information Document 2.3f, the “GLAS Science Software Architectural Design Document”, describes the I-SIPS software in more detail.

Table 3-1 Data Interface Control Organizations

Control Authority	File ID	File Name	System
NSIDC DAAC	GLA00	GLAS Production Data Sets GLAS Rate Buffered Data Sets	I-SIPS
	GLA01	Altimetry Data File	I-SIPS
	GLA02	Atmosphere Data File	I-SIPS
	GLA03	Engineering Data File	I-SIPS
	GLA04	SRS and GPS Data File	I-SIPS
	GLA05	Waveform-based Range Corrections File	I-SIPS
	GLA06	Elevation File	I-SIPS
	GLA07	Calibrated Backscatter File	I-SIPS
	GLA08	Boundary Layer and Elevated Aerosol Layer Heights File	I-SIPS
	GLA09	Cloud Height for Multiple Layers File	I-SIPS
	GLA10	Atmospheric Vertical Structure File	I-SIPS
	GLA11	Thin Cloud/Aerosol Optical Depth File	I-SIPS
	GLA12	Ice Sheet Elevation File	I-SIPS
	GLA13	Sea Ice Roughness File	I-SIPS
	GLA14	Land/Canopy Elevation File	I-SIPS
	GLA15	Ocean Elevation File	I-SIPS
GLAS Science Team	n/a	Instrument Packet Files	I-SIPS
	GLA01_SCF	Altimetry Data File	I-SIPS
	GLA02_SCF	Atmosphere Data File	I-SIPS
	GLA03_SCF	Engineering Data File	I-SIPS
	GLA04_SCF	SRS and GPS Data File	I-SIPS
	GLA05_SCF	Waveform-based Range Corrections File	I-SIPS
	GLA06_SCF	Elevation File	I-SIPS
	GLA07_SCF	Calibrated Backscatter File	I-SIPS
	GLA08_SCF	Boundary Layer and Elevated Aerosol Layer Heights File	I-SIPS
	GLA09_SCF	Cloud Height for Multiple Layers File	I-SIPS
	GLA10_SCF	Atmospheric Vertical Structure File	I-SIPS
	GLA11_SCF	Thin Cloud/Aerosol Optical Depth File	I-SIPS

Table 3-1 Data Interface Control Organizations (Continued)

Control Authority	File ID	File Name	System
GLAS Science Team	GLA12_SCF	Ice Sheet Elevation File	I-SIPS
	GLA13_SCF	Sea Ice Roughness File	I-SIPS
	GLA14_SCF	Land/Canopy Elevation File	I-SIPS
	GLA15_SCF	Ocean Elevation File	I-SIPS
	GLA ANC06	GLAS Metadata and Data Product Quality File	I-SIPS
	GLA ANC 08	Precision Orbit Data File	I-SIPS
	GLA ANC 09	Precision Attitude Data File	I-SIPS
	GLA ANC 11	Miscellaneous	I-SIPS
	GLA ANC 12	Digital Elevation Model	I-SIPS
	GLA ANC 13	Geoid File	I-SIPS
	GLA ANC 14	Pole Tide Model File	I-SIPS
	GLA ANC 15	Earth Tide Model File	I-SIPS
	GLA ANC 16	Load Tide Model File	I-SIPS
	GLA ANC 17	Ocean Tide Model File	I-SIPS
	GLA ANC 19	Surface Type Class File	I-SIPS
GLAS Science and Engineering Teams	GLA ANC 07	GLAS Coefficients and Constants ESDIS File	I-SIPS
NOAA	GLA ANC 01	Meteorological Data File	I-SIPS
	GLA ANC 05	Magnetic and Solar Flux Data File	I-SIPS
Crustal Dynamics Data and Information System	GLA ANC 03	Laser Tracking Data File	I-SIPS
	GLA ANC 10	GPS Tracking Data File	I-SIPS
Center for Space Research at the University of Texas at Austin	GLA ANC 04	IERS Polar Motion and Earth Rotation Data File	I-SIPS
MOC	GLA SUP 02 GLA SUP 03	Uplink and Downlink Schedules GLAS Housekeeping and Status Packets	ISF
ICESat Flight Operations Team	GLA SUP 05 GLA SUP 06 GLA SUP 07 GLA SUP 08 GLA SUP 12	Spacecraft Command Sequences Predicted Events File Spacecraft Flight Operations Schedule Spacecraft Ephemeris Data Files Event Log File	ISF

Table 3-1 Data Interface Control Organizations (Continued)

Control Authority	File ID	File Name	System
GLAS IOT	GLA SUP 01 GLA SUP 04 GLA SUP 09 GLA SUP 10 GLA SUP 11 GLA SUP 13	GLAS Instrument Operations Plan Instrument Command Blocks Telemetry Data Query Files Status Reports Instrument Performance Trend Files GLAS Command Requests	ISF

The ISF System performs the following function:

- obtain and store the Level 0 data and assess for instrument performance
- perform trend analysis
- report results
- build, review, and deliver commands as required

3.2 Technical Interfaces

The GLAS Standard Data Software interfaces with the Mission Operations Center (MOC), the EOSDIS DAAC, the EDOS, the GLAS SCF, and the GLAS ISF to obtain or deliver data. Additionally, the GLAS Standard Data Software will interface with various locations to obtain ancillary data. The following section provides general functional descriptions of each of the interfaces.

3.2.1 Mission Operations Center (MOC)

The MOC provides the interface between the ISF and the flight operations of the ICESat Spacecraft. Through this interface, the ISF sends command requests, receives near real time instrument housekeeping data and spacecraft data, and receives flight operations data and status.

3.2.2 Distributed Active Archive Center (DAAC)

Within the DAAC, all GLAS standard data products are stored and made available for retrieval by the GLAS Science Team and the science community. Metadata describing the quality and content of the GLAS standard data products will be stored as well as any documentation delivered by the GLAS Science Team to the ESDIS project. At the DAAC, all input ancillary data are stored and available for retrieval. The DAAC receives the Level 0 data from the EDOS and provides the Level 0 data to the SDS (via the GLAS SCF and the ISF). Interfaces to the DAAC will follow the standard described in *Applicable Document 2.2e*.

3.2.3 EOSDIS Data and Operations Center (EDOS)

Normally the EDOS delivers the Level 0 data directly to the DAAC and MOC. However, upon special request EDOS will transmit the Level 0 data directly to the ICESat SCF or the GLAS ISF. Interfaces to EDOS will follow the standard described in *Applicable Document 2.2d*.

3.2.4 GLAS Science Computing Facility (SCF)

The GLAS Science Team operates primarily through the GLAS SCF. The GLAS SCF is a distributed computing system with a node at each GLAS Science Team member location and a central node at the ICESat Project Scientist location. The central node, ICESat SCF, provides the primary link to the DAAC.

Ancillary files will be either generated on the science team member nodes or retrieved from the DAAC or other locations and stored on the ICESat SCF. The ICESat SCF will support the development, execution, and maintenance of the I-SIPS Software, and will be equipped with the ESDIS Science Data Processing Toolkit. The internal data products will be available to GLAS Science Team members for transfer to their GLAS SCF node from the ICESat SCF. The GLAS standard data products will be transferred from the central node to the DAAC for archival and science community availability.

More detailed information about the GLAS SCF is contained in the GLAS Science Computing Facility Plan, Information Document 2.3i.

3.2.5 GLAS Instrument Support Facility (ISF)

The ISF includes the computer workstation(s) and associated support equipment; the requirements and specifications for the ISF will be determined by the GLAS Science Team. The function of this facility will be to support GLAS instrument operations such as command, instrument health and welfare monitoring, and instrument performance assessment. This facility should support access to the UNIX system and tools by the Science, Instrument, and Instrument Operations Teams. The ISF shall support required operational instrument data access via standard network connections. The ISF is equipped with the ESDIS Instrument Support Terminal Toolkit. The ISF shall be operated in a secure manner to prevent unauthorized use.

3.2.6 Other Interface Nodes

GLAS Standard Data Software processing is expected to interface with certain EOS and non-EOS instrument systems data in support of the ancillary data file collection and generation activities. The sources for the external ancillary data are the GSFC DAAC, the Crustal Dynamics Data Information System (CDDIS), National Centers for Environmental Prediction (NCEP), and the University of Texas Center for Space Research (UTCSR). These sources utilize data provided by the International Earth Rotation Service (IERS) and the International GPS Service for Geodynamics (IGS).

The Crustal Dynamics Data Information System is identified as the data source for laser tracking data and GPS ground-based data to be used in precision orbit determination. This ancillary science processing further includes polar motion and earth rotation data from the IERS via the University of Texas Center for Space Research, and meteorological, magnetic and solar flux data via the GSFC DAAC.

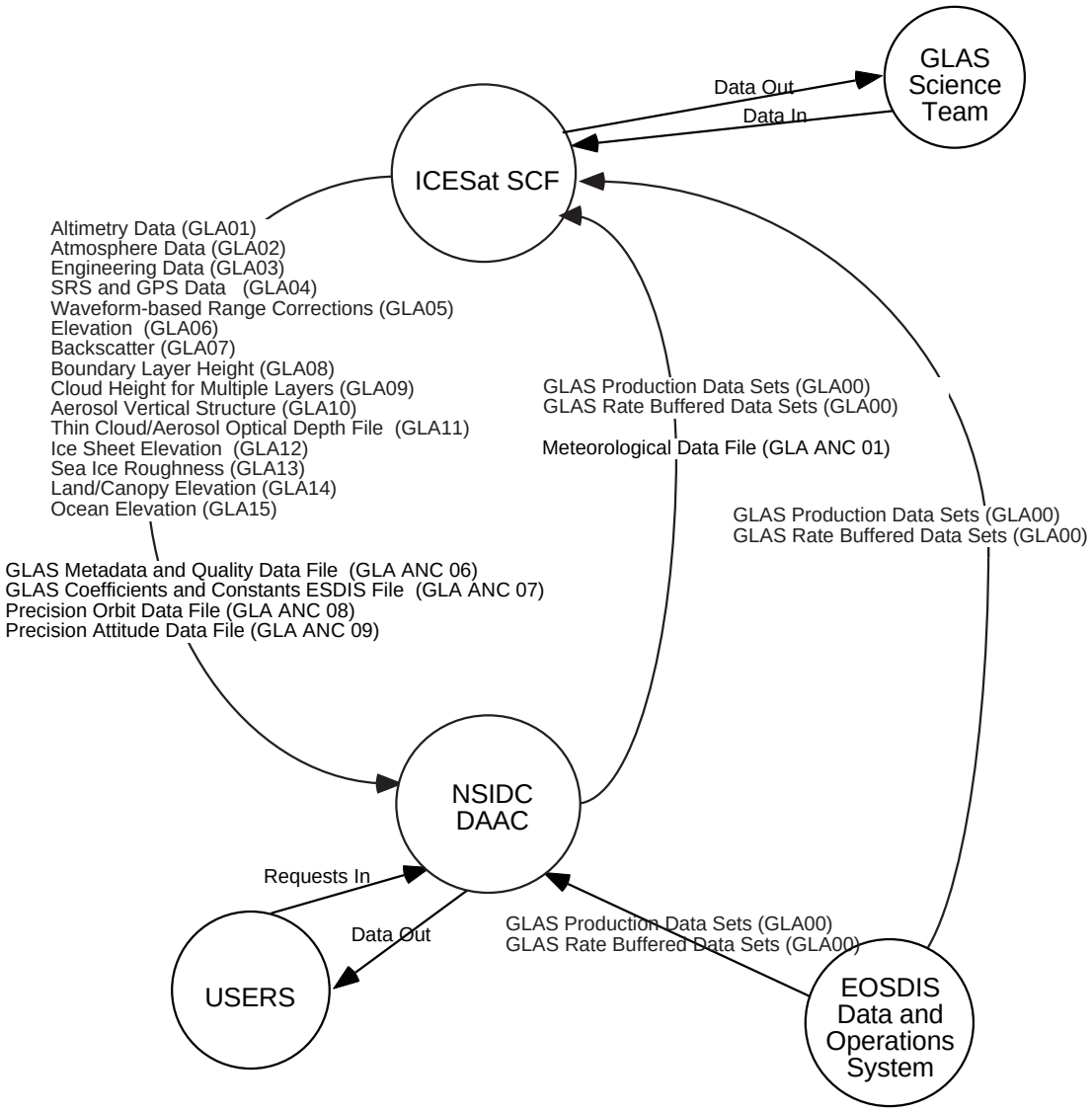

Figure 3-1 The I-SIPS Software Data Flow

3.3 Interface Controls

The ESDIS will provide the interface controls for the EDOS and the DAAC. These controls will ensure the security and integrity of the instrument and science data stored within the DAAC. The controls will also ensure the security and integrity of the communications to and from the spacecraft.

The GLAS SCF interface controls will be provided by the GLAS Science Team. Those hardware nodes, physically located at Science Team Member sites and at the NASA Goddard Space Flight Center, are generally under the access control of the assigned

investigator, user, and designated custodian. Equipment is generally accessed and used by a single team member, a designated research assistant, or authorized contractor personnel. Routine agency and institutional instructions require investigation-related hardware and software to be attended, and when left unattended, maintained behind locked doors.

Computer systems, hosts, and network nodes operated, supplied by, or maintained by other agencies or institutions are assumed to be under the direct control and authority of that institution or agency. Systems such as the nodes used by the GLAS Science Team at the University of Texas to perform the precision orbit and attitude determination are under the control and operational authority of the University of Texas Center for Space Research. Agency and institution nodes accessing or providing access to other ESDIS nodes shall be operated and maintained in such a manner as to prevent spurious or unauthorized access or use by non-team parties.

These measures entail proper use of all nodes as designated and authorized. Equipment at node sites shall be used only by the designated user or designated agent, and access shall be controlled in accordance with prescribed procedures and authorization. User identification and password measures will be employed in accordance with published NASA Security Guidelines.

3.4 Configuration Management

Configuration management is a key process in maintaining the integrity of the GLAS data files within the SCF and the DAAC, and of the software which produces the files. Configuration management encompasses change control, problem reporting and problem resolution.

Any recommended change to the baselined software or file definitions is initiated by an Engineering Change Proposal (ECP). Within the ECP, the revisions are proposed along with implementation considerations and are then submitted to a defined Change Control Board for evaluation. Configuration status accounting reports are maintained, providing a readily available history for software and file changes. Additional configuration management details are contained in Parent Document 2.1b, the GLAS Software Management Plan.

3.5 Quality Assurance

Automatic or manual Quality Assurance (QA) is provided for each Standard Data Product file and ancillary file. Any file requiring manual QA is interimly tagged as unvalidated, but is available for distribution per request. When the manual validation has been completed, the file is marked as validated. The QA information will be stored within the product metadata.

Section 4

GLAS Standard Data Products

This section describes the standard data products generated by the GLAS Standard Data Software. The data products are referenced in this document by their file name and file ID. Current volume and frequency estimates for each of the GLAS standard data products are contained in Table 4-1 "GLAS Standard Data Products Volume and Frequency". However, the official volume and frequency data are contained in the Applicable Document 2.2a, Applicable Document 2.2b, and Applicable Document 2.2c.

Table 4-1 GLAS Standard Data Products Volume and Frequency

File ID	File Name	Volume (Mb)*	Frequency per Day*	Temporal Coverage (minutes)
GLA00	GLAS PDS (Telemetry Data)	2166	4	360
GLA00	GLAS Rate Buffered Data Files	3.8	4	360
n/a	GLAS Instrument Packet File	1083	8	180
GLA01	Altimetry Data File	30	56	26
GLA02	Atmosphere Data File	354	7	206
GLA03	Engineering Data File	82.128	1	1440
GLA04	SRS and GPS Data File	1210	2	720
GLA05	Waveform-based Range Corrections File	15	56	26
GLA06	Elevation File	446.774	1	1440
GLA07	Backscatter File	788	7	206
GLA08	Boundary Layer and Elevated Aerosol Layer Heights File	7.687	1	1440
GLA09	Cloud Height for Multiple Layers File	76.721	1	1440
GLA10	Aerosol Vertical Structure File	303.834	1	1440
GLA11	Thin Cloud/Aerosol Optical Depth File	17.785	1	1440
GLA12	Ice Sheet Products File	256.003	1	1440
GLA13	Sea Ice Products File	361.411	1	1440
GLA14	Land Products File	455.414	1	1440
GLA15	Ocean Products File	245.635	1	1440

n/a - Not applicable
*Volume and frequency data are estimates; official data are maintained in latest Data Product Specifications

The format of the Level 1 standard data product files is HDF. The format of the Level 2 standard data product files is HDF-EOS. HDF (Hierarchical Data Format) is a multi-object file format that facilitates the transfer of data; HDF-EOS is a special format developed for the EOS Project. Table 1-1 lists internal products GLA01_SCF - GLA15_SCF; these are the standard data products described in this section without the HDF/HDF-EOS formatting. The internal products are not discussed in this document.

The ESDIS is responsible for making the GLAS standard data products available to the science community. The ESDIS is the control authority (responsible for the quality and integrity of a file) for the GLAS Standard Data Products archived at the DAAC. The GLAS Science Team is responsible for verifying and validating the standard data products' contents and providing the data quality information. The GLAS Science Team is the control authority for the standard data products while they are stored on the ICESat SCF. Metadata describing each data product will be available through the DAAC. The term “I-SIPS Team” is used to describe personnel at the ICESat SCF who will perform the routine operations of the GLAS I-SIPS Software.

4.1 GLAS Production Data Sets (GLA00)

4.1.1 Purpose

The GLAS Production Data Sets (PDS) contain the Level 0 X-band telemetry data collected during each tracking pass. The data in this file will be used to monitor the instrument performance and health, and to create the input to the I-SIPS Software (see section 4.3).

4.1.2 Content and Format

The X-band telemetry data includes instrument packets and support data packets collected by the EOS Polar Ground Stations (EPGS). Unique instrument packets and support data packets are identified by the application process identifier (APID). A PDS consists of CCSDS (Consultative Committee for Space Data Systems) packets from a single APID. The GLAS PDS is generated by EDOS from the data collected by the EPGS. The level 0 data in the PDS has been frame synced and redundant packets are removed. The detailed description and format specification of each GLAS APID are contained in the GLAS Level 0 Instrument Data Products Specification, Applicable Document 2.2c. The PDS are described in the ICD between EDOS and the EGS; see Applicable Document 2.2d.

4.1.3 Source, Destination, and Transfer Method

The GLAS PDSs are delivered to the ICESat SCF from EDOS. EDOS concurrently delivers the PDSs to the DAAC for archive. The GLAS PDSs are available for retrieval from the DAAC using the ESDIS-supplied toolkits and procedures.

4.2 GLAS Rate Buffered Data File (GLA00)

4.2.1 Purpose

The GLAS Rate Buffered Data Files contain the Level 0 S-band housekeeping data collected by the EPGS during each tracking pass. The data in this file will be used to monitor the instrument performance and health, and can be used to generate the housekeeping portion of the Level 0 input to the I-SIPS Software.

4.2.2 Content and Format

The S-band telemetry data includes instrument packets and support data packets collected by the EPGS. Unique instrument packets and support data packets are identified by the application process identifier (APID). A rate buffered data file consists of packets from a single APID. The file is generated by EDOS from the data collected by the EPGS. The S-band telemetry data is not processed by EDOS. The detailed description and format specification of each GLAS APID are contained in the GLAS Level 0 Instrument Data Products Specification, Applicable Document 2.2c. The rate buffered data files are described in the ICD between EDOS and the EGS, see Applicable Document 2.2d.

4.2.3 Source, Destination, and Transfer Method

The GLAS Rate Buffered Data Files are delivered to the ICESat SCF and the DAAC by EDOS. The files can be retrieved from the DAAC using the ESDIS-provided tools and procedures.

4.3 GLAS Instrument Packet File

4.3.1 Purpose

This file is created from the GLAS PDS delivered by EDOS. The data in this file will be used by other processes to monitor the instrument performance and health, and to create the Level 1 data products. The GLAS Rate Buffered Data Files can be used to generate the housekeeping portion of the instrument packet file when the PDSs are not available. This file is not a standard data product, but it is a required input file to the I-SIPS Software.

4.3.2 Content and Format

The GLAS instrument packet file is actually composed of several files each containing data from a particular APID for the time period. The files contain the following:

- Instrument telemetry data
  - Laser Altimeter
  - LIDAR
  - Monitor outputs
  - Status
- Instrument support data

  - Star cameras
  - Laser reference system
  - GPS receivers
- Header and timing elements

The detailed file contents description and file format specification are contained in the GLAS Level 0 Instrument Data Products Specification, Applicable Document 2.2c.

4.3.3 Source, Destination, and Transfer Method

The Level 0 Instrument Packet Files are generated by the I-SIPS Software pre-processor from the PDSs delivered by EDOS. The files are used by the Level 1A standard data product generation algorithms on the ICESat SCF. The I-SIPS Team will ensure the files are available prior to the execution time of the Level 1A algorithms requiring the Level 0 data for input. The Instrument Packet Files will remain available on the ICESat SCF for reprocessing.

4.4 Level 1A Data Product Files (GLA01, GLA02, GLA03, GLA04)

4.4.1 Purpose

The Level 1A files provide the GLAS telemetry data in engineering units to the GLAS Science Team and to the science community. The data in the Level 1A files will be used by other processes to create the Level 1B and Level 2 data products.

4.4.2 Content and Format

The files contain the GLAS Level 1A data which is the time-ordered instrument data converted from raw form to engineering units. The GLA01 file (Altimetry Data File) contains altimeter height, waveform data, and other data required to produce the Level 1B elevation products. The GLA02 file (Atmosphere Data File) contains the LIDAR data and other data required to produce the Level 1B atmosphere products. The GLA03 file (Engineering Data File) contains the engineering monitor and status values converted from raw data to engineering units. The GLA04 file (SRS and GPS Data File) contains the output from the SRS (Stellar Reference System), the GPS (Global Positioning System), and other instrument and spacecraft data required to produce the precision orbit and attitude. Each of the Level 1A files includes the spacecraft timing information. The detailed file content descriptions and format specifications are contained in the GLAS Level 1 Standard Data Products Specification, Applicable Document 2.2a.

4.4.3 Source, Destination, and Transfer Method

The Level 1A files are produced by the I-SIPS Software standard data processing algorithms on the ICESat SCF and are delivered to and archived on the DAAC. The files are used by the standard data products generation algorithms on the ICESat SCF to create the Level 1B data products. The I-SIPS Team will ensure that the correct Level 1A files are created and available prior to the execution time of the Level 1B algorithms requiring the data as input. The files are available for transfer from the

ICESat SCF to the Science Team GLAS SCF nodes, using standard UNIX file transfer tools. The GLAS Science Team will evaluate the Level 1A files for quality and content assessment, and will transfer that information to the ICESat SCF to be incorporated into the metadata delivered to the DAAC. The science community can retrieve the Level 1A files from the DAAC using the ESDIS-supplied file transfer tools and procedures.

4.5 Waveform-based Range Corrections File (GLA05)

4.5.1 Purpose

The purpose of this file is to store all computations made from the waveform data and the parameterization of the waveform. The data in this file will be used by other processes to create the Level 1B data product, the Elevation File.

4.5.2 Content and Format

This file contains the range, corrections to the range from the retracking algorithms, and the laser spot location. The detailed file contents description and format specification are contained in the GLAS Level 1 Standard Data Products Specification, Applicable Document 2.2a.

4.5.3 Source, Destination, and Transfer Method

The GLA05 file is produced on the ICESat SCF by the Level 1B standard data processing algorithms. The file is delivered to and archived at the DAAC. The file is used by the standard data products generation algorithms which produce the Level 1B elevation product. The I-SIPS Team ensures that the correct GLA05 file is created and available prior to the execution time of the algorithms requiring its data for input. The file is available for transfer from the ICESat SCF to the Science Team GLAS SCF nodes using standard UNIX file transfer tools. The science community can retrieve the file from the DAAC using the ESDIS-supplied tools and procedures. The GLAS Science Team will evaluate the GLA05 file for quality and content assessment and transfer that information to the ICESat SCF to be incorporated into the metadata delivered to the DAAC

4.6 Elevation File (GLA06)

4.6.1 Purpose

This file provides the elevation expressed in an Earth-fixed, center-of-mass reference frame. The data in this file will be used by other processes to create the Level 2 data products.

4.6.2 Content and Format

This Level 1B data file contains the following:

- Elevation (40 hertz)
- Corrections to the elevation

- Elevation distribution within the LASER footprint
- Reflectance
- Vegetation canopy height parameters
- Associated timing and data quality information

Included in the file are the precision orbit georeference location and quality information. The detailed file contents description and format specification are contained in the GLAS Level 1 Standard Data Products Specification, Applicable Document 2.2a.

4.6.3 Source, Destination, and Transfer Method

Level 1B standard data processing algorithms executed on the ICESat SCF create the GLA06 file. The file is delivered to and archived at the DAAC. The GLA06 file is used by the standard data products generation algorithms on the ICESat SCF to produce the Level 2 products. The I-SIPS Team ensures that the correct file is created and available prior to the execution time of the Level 2 algorithms requiring GLA06 for input. The file is available for transfer from the ICESat SCF to the Science Team GLAS SCF nodes using standard UNIX file transfer tools. The science community can retrieve the GLA06 data from the DAAC using the ESDIS-supplied tools and procedures. The GLAS Science Team will evaluate the GLA06 file for quality and content assessment and transfer that information to the ICESat SCF to be incorporated into the metadata delivered to the DAAC

4.7 Backscatter File (GLA07)

4.7.1 Purpose

This file provides the attenuated backscatter vertical profile to the GLAS Science Team and to the science community. The data in this file will be used by other processes to create the Level 2 atmospheric data products.

4.7.2 Content and Format

This Level 1B data file contains the corrected attenuated backscatter vertical profiles. The timing and quality information for the profiles are contained in the file. The detailed file contents description and format specification are contained in the GLAS Level 1 Standard Data Products Specification, Applicable Document 2.2a.

4.7.3 Source, Destination, and Transfer Method

The GLA07 file is produced on the ICESat SCF by the Level 1B standard data processing algorithms. The Science Team members can retrieve the GLA07 file from the ICESat SCF and store on their GLAS SCF node using standard UNIX file transfer tools. The Science Team evaluates the Backscatter File for data quality and returns that information to the ICESat SCF to be incorporated into the metadata delivered to the DAAC. The GLA07 file is delivered to the DAAC for archival. The file is used by the standard data products generation algorithms on the ICESat SCF to produce Level 2 products. The I-SIPS Team will ensure that the correct GLA07 file is created and available prior to the execution time of the Level 2 algorithms requiring the data for input.

The GLA07 file is available to the science community from the DAAC; file retrievals from the DAAC are accomplished using the ESDIS-supplied tools and procedures.

4.8 Boundary Layer Height File (GLA08)

4.8.1 Purpose

This Level 2 file provides the GLAS planetary boundary layer height and elevated aerosol layer heights for atmosphere and climate studies to the GLAS Science Team and to the science community.

4.8.2 Content and Format

This file contains the planetary boundary layer height at two resolutions, and the tops and bottoms of the elevated aerosol layers as derived from the aerosol structure. The data in this file occur at varying rates. Included in the file are the precision orbit georeference location, timing, and quality information. The detailed file contents description and format specification are contained in the GLAS Level 2 Standard Data Products Specification, Applicable Document 2.2b.

4.8.3 Source, Destination, and Transfer Method

The Level 2 standard data processing algorithms executed on the ICESat SCF produce the GLA08 file. The file is available for transfer from the ICESat SCF to the Science Team GLAS SCF nodes using standard UNIX file transfer tools. The GLAS Science Team will evaluate the file for data quality and content and will transfer that information to the ICESat SCF to be incorporated into the metadata delivered to the DAAC. The file is used by the standard data products generation algorithms on the ICESat SCF to produce additional Level 2 products (GLA10 and GLA11). The I-SIPS Team will ensure that the correct GLA08 file is created and available prior to the execution time of the Level 2 algorithms requiring the data for input. The GLA08 file is delivered to and archived at the DAAC. The science community can obtain the GLA08 data from the DAAC by using the ESDIS-supplied tools and procedures.

4.9 Cloud Height for Multiple Layers File (GLA09)

4.9.1 Purpose

This file provides cloud layer boundaries to the GLAS Science Team and to the science community for atmosphere and climate studies.

4.9.2 Content and Format

This Level 2 data file contains the cloud tops and cloud bottoms referenced from the mean sea surface and at varying resolutions. Included in the file are the precision orbit georeference location, timing, and quality information. The detailed file contents description and format specification are contained in the GLAS Level 2 Standard Data Products Specification, Applicable Document 2.2b.

4.9.3 Source, Destination, and Transfer Method

The GLA09 file is produced on the ICESat SCF by the Level 2 standard data processing algorithms. The file is available for transfer from the ICESat SCF to the Science Team GLAS SCF nodes using standard UNIX file transfer tools. The Science Team will perform quality and content assessment on the GLA09 data and transfer the information to the ICESat SCF to be incorporated into the metadata delivered to the DAAC. The file is used by the standard data products generation algorithms on the ICESat SCF to produce additional atmospheric products (GLA08, GLA10 and GLA11). In addition, the file is used to provide atmospheric information to the process which creates the Level 1B elevation data. The I-SIPS Team will ensure that the correct GLA09 file is created and available prior to the execution time of the Level 1B and Level 2 algorithms requiring the data for input. The GLA09 file is delivered to and archived at the DAAC. The science community can obtain the cloud height data product from the DAAC by using the ESDIS-supplied tools and procedures.

4.10 Aerosol Vertical Structure File (GLA10)

4.10.1 Purpose

This file provides the GLAS aerosol and cloud cross-section data for atmosphere and climate studies to the GLAS Science Team and to the science community.

4.10.2 Content and Format

This file contains the following:

- Aerosol backscatter cross section
- Aerosol extinction cross section
- Cloud backscatter cross section
- Cloud extinction cross section

Included in the file are the precision orbit georeference location, timing, and quality information. The data in this file occur at varying rates. The detailed file contents description and format specification are contained in the GLAS Level 2 Standard Data Products Specification, Applicable Document 2.2b.

4.10.3 Source, Destination, and Transfer Method

The Level 2 standard data processing algorithms executed on the ICESat SCF produce the GLA10 file. The file is available for transfer from the ICESat SCF to the Science Team GLAS SCF nodes using standard UNIX file transfer tools. The Science Team will evaluate the aerosol vertical structure data for quality and content and transfer that information to the ICESat SCF to be incorporated into the metadata delivered to the DAAC. The GLA10 file is delivered to the DAAC for archival. The Aerosol Vertical Structure File is available to the science community at the DAAC and can be retrieved using the ESDIS-supplied tools and procedures.

4.11 Thin Cloud/Aerosol Optical Depth File (GLA11)

4.11.1 Purpose

This file provides the aerosol and cloud optical depth data to the GLAS Science Team and to the science community for atmosphere and climate studies.

4.11.2 Content and Format

This file contains the Level 2 optical depth data for the planetary boundary, elevated aerosol, and cloud layers. The data in this file occurs at varying rates. Included in the file are the precision georeference orbit location, timing, and quality information. The detailed file contents description and format specification are contained in the GLAS Level 2 Standard Data Products Specification, Applicable Document 2.2b.

4.11.3 Source, Destination, and Transfer Method

The GLA11 file is produced on the ICESat SCF by the Level 2 standard data processing algorithms. The file is available to the Science Team for transfer from the ICESat SCF to their GLAS SCF nodes using standard UNIX file transfer tools. The Science Team will evaluate the file for data quality and content at the ICESat SCF and return that information to be incorporated into the metadata delivered to the DAAC. In addition, the file is used to provide atmospheric information to the process which creates the Level 1B elevation data. The I-SIPS Team will ensure that the correct GLA11 file is created and available prior to the execution time of the Level 1B algorithms requiring the data for input. The GLA11 file is delivered to the DAAC for archival. The science community can retrieve the GLA11 products from the DAAC using the ESDIS-supplied tools and procedures.

4.12 Level 2 Elevation Data Product Files (GLA12, GLA13, GLA14, GLA15)

4.12.1 Purpose

These files provide the corrected elevations, reflectivities, and surface elevation distribution within the footprint, as determined from the GLAS Level 1 data, to the GLAS Science Team and the science community for morphology and climate studies.

4.12.2 Content and Format

These files contain the Level 2 corrected elevations above the reference ellipsoid, surface elevation distribution and reflectance data at the 40 hertz rate. The files include precision orbit georeference location, timing, and quality information, as well as the elevation corrections, elevation distribution, and reflectance data. By providing the corrections to the elevation data, users can remove them from the data as desired. Each of the Level 2 Elevation Data Product Files is specific to a surface type (ice sheet, sea ice, land/canopy, or ocean) as determined from a surface type grid. The file names are Ice Sheet Products File (GLA12), Sea Ice Products File (GLA13), Land Products File (GLA14), and Ocean Products File (GLA15). The detailed file contents

descriptions and format specifications are contained in the GLAS Level 2 Standard Data Products Specification, Applicable Document 2.2b.

4.12.3 Source, Destination, and Transfer Method

The Level 2 standard data processing algorithms, executed on the ICESat SCF, will produce the Level 2 Elevation Data Product Files. The files are available for transfer from the ICESat SCF to the Science Team GLAS SCF nodes using standard UNIX file transfer tools. The Science Team will perform data quality and content assessment of the Level 2 elevation data and return that information to the ICESat SCF to be incorporated into the metadata delivered to the DAAC. The Level 2 Elevation Data Product files are delivered to the DAAC for archival. The science community can obtain the data products from the DAAC using the ESDIS-supplied file transfer tools and procedures.

Section 5

Ancillary Data

Ancillary data files are the externally-generated input files and the internally-generated intermediate files used by the GLAS Standard Data Software. The ancillary file names and file IDs are listed in Table 5-1 “GLAS Ancillary Data Products Volume and Frequency”, along with file volume and frequency per day.

Table 5-1 GLAS Ancillary Data Products Volume and Frequency

File ID	File Name	Volume (Mb)	Frequency per Day	Temporal Coverage
GLA ANC 01	Meteorological Data File	2.074	1	1440
GLA ANC 03	Laser Tracking Data File	2.074	1	1440
GLA ANC 04	IERS Polar Motion and Earth Rotation Data File	1.037	1	1440
GLA ANC 05	Magnetic and Solar Flux Data File	1.037	1	1440
GLA ANC 06	GLAS Metadata and Data Product Quality Data File	2.074	1	1440
GLA ANC 07	GLAS Coefficients and Constants File	1.000	n/a	n/a
GLA ANC 08	Precision Orbit Data File	2.074	1	1440
GLA ANC 09	Precision Attitude Data File	2.074	1	1440
GLA ANC 10	GPS Tracking Data File	2.074	1	1440
GLA ANC 11	Miscellaneous Data File	1.000	n/a	n/a
GLA ANC 12	Digital Elevation Model	1.000	n/a	n/a
GLA ANC 13	Geoid File	1.000	n/a	n/a
GLA ANC 14	Pole Tide Model File	1.000	n/a	n/a
GLA ANC 15	Earth Tide Model File	1.000	n/a	n/a
GLA ANC 16	Load Tide Model File	1.000	n/a	n/a
GLA ANC 17	Ocean Tide Model File	1.000	n/a	n/a
GLA ANC 19	Surface Type Class File	1.000	n/a	n/a

n/a - Not applicable

For the ancillary data, the initial control authority is the source or generating site - the control authority will ensure that the data is valid. The source institutions for the externally-generated input data files will perform quality-checking prior to transferal

to the EOSDIS Distributed Active Archive Center (DAAC). The ESDIS becomes the control authority and will ensure the data's integrity of ancillary data that is delivered to the DAAC.

Each of the ancillary files is described in terms of: purpose, content, format, source, destination, transfer method, and control authority.

5.1 Meteorological Data File (GLA ANC 01)

5.1.1 Purpose

The Meteorological Data File provides the global meteorological measurements from which corrections for tropospheric retardation of the laser pulses will be determined. [The ATBD: *Atmospheric Delay Correction to GLAS Laser Altimeter Ranges* will include the process to transform the GLA ANC 01 into atmospheric delay.]

5.1.2 Content and Format

The contents of the GLA ANC 01 file include:

- Global elevations at the pressure fields, which are used to identify the surface pressure range.
- Global temperatures at the pressure fields.
- Global relative humidity at the pressure fields, which are used along with the above two variables to calculate surface pressure and dry tropospheric delay corrections.
- Global water vapor vertical structure from which wet tropospheric range corrections are to be computed.
- Date(s) and times for applicability of the data.

A detailed file contents and format description is provided in Appendix A.

5.1.3 Source, Destination, and Transfer Method

The NCEP Global Analysis, a 1 by 1 degree gridded data with 6 hour sampling, will be used. The initial source of this ancillary file will be the National Centers for Environmental Prediction (NCEP) of NOAA. The Meteorological Data File will be stored on the DAAC for availability to the GLAS processing. Using the ESDIS-supplied file transfer tools and procedures, the file will be retrieved from the DAAC by the I-SIPS Team and stored on the ICESat SCF. The file will be used as input to the Level 1B standard product generation algorithms on the ICESat SCF.

5.1.4 Control Authority

Initially, NCEP will ensure the validity of the file contents. ESDIS will ensure the integrity of the file as stored in the DAAC. The I-SIPS Team will ensure the integrity of the file stored on the ICESat SCF.

5.1.5 Availability, Storage, and Retention

The DAAC operations team will be responsible for retrieving the GLA ANC 01 file from the NCEP of NOAA. The I-SIPS Team will be responsible for retrieving the file from the DAAC and storing on the ICESat SCF. This file should be retrieved and available on the ICESat SCF to executing the algorithm that produces the GLA07 product. The file should be available at the DAAC for the life of the GLAS investigation in case re-processing is required.

5.2 Laser Tracking Data File (GLA ANC 03)

5.2.1 Purpose

The Tracking Data File provides the ground-based laser tracking data of the spacecraft, for input to the Precision Orbit Determination.

5.2.2 Content and Format

The contents of this file include:

- Time-ordered laser range measurements from identified groundbased laser trackers.
- Uncertainties associated with each laser measurement.
- Flags indicative of difficulties associated with acquiring the data and creating the file.

A detailed file contents and format description is provided in Appendix A.

5.2.3 Source, Destination, and Transfer Method

The initial source of the tracking data file is the Laser Tracking Archive of the Crustal Dynamics Data and Information System (CDDIS) and the IGS. The file will be retrieved from CDDIS by the I-SIPS Team, and stored on the GLAS SCF node, UTGLAS SCF. The Precision Orbit Determination and Precision Attitude Determination will be performed on the UTGLAS SCF.

5.2.4 Control Authority

Initially, the CDDIS is the control authority for the tracking data file. The GLAS science team is responsible for the integrity of the file on the UTGLAS SCF.

5.2.5 Availability, Storage, and Retention

The I-SIPS Team will be responsible for retrieving the GLA ANC 03 file from the CDDIS. This file should be retrieved and available prior to executing the precision orbit determination process that requires its data for input. The I-SIPS Team shall ensure the file is available for processing. The file should be available for the life of the GLAS investigation in case re-processing is required.

5.3 IERS Polar Motion and Earth Rotation Data File (GLA ANC 04)

5.3.1 Purpose

The IERS Polar Motion and Earth Rotation Data File provides the parameters of polar motion and earth rotation for input to Precision Orbit Determination process.

5.3.2 Content and Format

The contents of this file include:

- Time-ordered polar motion parameters, per International Earth Rotation Service (IERS) standards.
- Time-ordered UT1-TAI time differences.

A detailed file contents and format description is provided in Appendix A.

5.3.3 Source, Destination, and Transfer Method

The initial source of the file will be the Center for Space Research (CSR) at the University of Texas Austin. The file will be stored on the UTGLAS SCF for precision orbit determination.

5.3.4 Control Authority

The initial control authority for the IERS Polar Motion and Earth Rotation Data File is the CSR at the University of Texas Austin. The GLAS Science Team is responsible for the integrity of the file on the UTGLAS SCF.

5.3.5 Availability, Storage, and Retention

The I-SIPS Team will be responsible for retrieving the GLA ANC 04 file from the CSR at the University Texas Austin. This file should be retrieved and available prior to executing the precision orbit determination process that requires its data for input. The I-SIPS Team shall ensure the file is available for processing. The file should be available for the life of the GLAS investigation in case re-processing is required.

5.4 Magnetic and Solar Flux Data File (GLA ANC 05)

5.4.1 Purpose

The Magnetic and Solar Flux Data File provides the magnetic and solar flux parameters for input to the Precision Orbit Determination process. These parameters are used in the computation of drag and solar radiation effects on the spacecraft.

5.4.2 Content and Format

The contents of this file include:

- Global, time-ordered, magnetic parameters.
- Global, time-ordered, solar flux parameters.
- Uncertainties associated with the parameters.

- Flags indicative of difficulties associated with acquiring the data and creating the file.

A detailed file contents description is provided in Appendix A.

5.4.3 Source, Destination, and Transfer Method

The initial source of the file will be the Climate Monitoring and Diagnostics Laboratory (CMDL) of NOAA in Boulder, CO. The file will be retrieved from the CMDL of NOAA and stored on the UTGLAS SCF for the precision orbit determination.

5.4.4 Control Authority

The initial control authority for the Magnetic and Solar Flux Data File is the CMDL of NOAA. The GLAS Science Team is responsible for the integrity of the file on the UTGLAS SCF.

5.4.5 Availability, Storage, and Retention

The I-SIPS Team will be responsible for retrieving the GLA ANC 05 file from the CMDL of NOAA. The I-SIPS Team will retrieve this file and store on the UTGLAS SCF prior to executing the precision orbit determination process that requires its data for input. The I-SIPS Team shall ensure the file is available for processing. The file should be available for the life of the GLAS investigation in case re-processing is required.

5.5 GLAS Metadata and Data Product Quality File (GLA ANC 06)

5.5.1 Purpose

The GLAS Metadata and Data Product Quality Data File provides descriptive information about the GLAS standard Data Products.

5.5.2 Content and Format

The contents of this file include:

- Product Quality data, pertaining to factors which may affect the product.
- Data acquisition data, pertaining to environmental or other factors which may have affected the raw data.
- Other information such as a software change which may be of interest to the data analyst.

A detailed file contents and format description is provided in Appendix A.

5.5.3 Source, Destination, and Transfer Method

The GLA ANC 06 file will be generated by the I-SIPS Software during the generation of the Level 1 and 2 standard data products. The GLA ANC 06 file may be updated with additional information after the data products are reviewed and assessed on the ICESat SCF. The file will be delivered to the DAAC using the ESDIS-supplied file transfer tools and procedures.

5.5.4 Control Authority

The initial control authority for this file is the GLAS Science Team. Control passes to ESDIS upon delivery of the file to the DAAC.

5.5.5 Availability, Storage, and Retention

The I-SIPS Team will be responsible for delivering the GLA ANC 06 file to the DAAC. This file will be delivered with the standard data products it describes. The DAAC operations team shall ensure the file is available for retrieval from the DAAC. The file should be available for the life of the GLAS Investigation.

5.6 GLAS Coefficients and Constants File (GLA ANC 07)

5.6.1 Purpose

Some coefficients and constants in the Standard Data Software are subject to modification based on: pre-flight testing, on-orbit performance, or electronic component aging. To avoid creating and delivering new versions of software due to changes in operating parameters, the GLAS Coefficients and Constants File provides a location to store those software parameters.

5.6.2 Content and Format

The contents of this file include:

- Data conversion coefficients and constants for all the GLAS Science algorithms used in the processing. These may include:

  Instrument calibration constants and coefficients (i.e., 532nm deadtime correction table, analog to digital conversion constants/coefficients)

  Science processing lookup tables (i.e., cloud and aerosol constants, absorption ratio, Multiple scattering factor)

- Global constants such as the speed of light which are used in multiple algorithms.
- Constants such as thresholds, tolerance levels, and limits.

Each parameter contained in the file has an accompanying description. The file will contain a version number, date, and history. A detailed file contents and format description is provided in Appendix A.

5.6.3 Source, Destination, and Transfer Method

The file will be created on the ICESat SCF by the GLAS Software Development Team from inputs provided by the GLAS Science and Instrument Teams. The file will be used by the Standard Data Software on the ICESat SCF. The file will be archived to the DAAC using the ESDIS-supplied file transfer tools and procedures.

5.6.4 Control Authority

The file will be approved by the GLAS Science and Instrument Teams prior to its use by the Standard Data Software and delivery to DAAC. ESDIS will ensure the file's integrity once it is stored on the DAAC.

5.6.5 Availability, Storage, and Retention

The I-SIPS Team is responsible for ensuring the correct version of the file is available prior to executing the processes that require its data as input. The I-SIPS Team will be responsible for delivering the GLA ANC 07 file to the DAAC for archival. The file should be available for the life of the GLAS investigation in case re-processing is required. The latest version of the file would normally be used for re-processing, but the approval/agreement of the GLAS Science Team must be obtained prior to using the file.

5.7 Precision Orbit Data File (GLA ANC 08)

5.7.1 Purpose

The Precision Orbit Data File provides the time-referenced precision latitude, longitude, and altitude for the center of mass of the spacecraft. Data from this file are used to georeference the Level 1B GLAS standard data products, using a specially-tuned orbit interpolator.

5.7.2 Content and Format

The contents of this file include:

- Time-ordered spacecraft Earth-fixed state vector, at 30-second intervals (sufficient for GLAS due to lower altitude).
- The date and time of each state vector.

A detailed file contents and format description is provided in Appendix A.

5.7.3 Source, Destination, and Transfer Method

The file will be created by the precision orbit determination process on the UTGLAS SCF and transferred to the ICESat SCF. This file will be input to the Level 1B algorithms which are executed on the ICESat SCF. The GLA ANC 08 file will be delivered to the DAAC to be archived. File transfers to the DAAC will be completed using the ESDIS-supplied file transfer tools and procedures.

5.7.4 Control Authority

Each Precision Orbit File will be verified and approved by the GLAS Science Team prior to its use by the Standard Data Software and its delivery to the DAAC. The ESDIS will be the control authority for those files stored on the DAAC.

5.7.5 Availability, Storage, and Retention

The I-SIPS Team will ensure the GLA ANC 08 file is available on the ICESat SCF prior to executing the algorithms which create the Level 1B products. The I-SIPS Team is

responsible for delivering the file to the DAAC for archival. The file should remain available on the DAAC for the life of the GLAS investigation in case re-processing is required.

5.8 Precision Attitude Data File (GLA ANC 09)

5.8.1 Purpose

The Precision Attitude Data File provides the off-nadir component of the laser measurement's footprint.

5.8.2 Content and Format

The contents of this file include:

- Time-ordered pointing vectors (deviations from nadir) of the laser, in decimal degrees and direction, from the External Laser Pointing Monitor on the spacecraft.
- Uncertainties associated with the pointing vectors.

A detailed file contents description is provided in Appendix A.

5.8.3 Source, Destination, and Transfer Method

The file will be created from star camera Level 0 data processed on the UTGLAS SCF and transferred to the ICESat SCF. This file will be input to the Level 1B algorithms which are executed on the ICESat SCF. The file will be delivered to the DAAC for archiving. File transfers to the DAAC will be accomplished using the ESDIS-supplied file transfer tools and procedures.

5.8.4 Control Authority

The GLAS Science Team will verify and approve the Precision Attitude File prior to its use by the Standard Data Software and delivery to the DAAC. Upon delivery to the DAAC, the ESDIS becomes the control authority for the files.

5.8.5 Availability, Storage, and Retention

The I-SIPS Team will ensure the file is available prior to executing the algorithms that produce the Level 1B products. The I-SIPS Team is responsible for delivering the file to the DAAC. On the DAAC, the file should remain available for the life of the GLAS investigation in case re-processing is required.

5.9 GPS Tracking Data File (GLA ANC 10)

5.9.1 Purpose

The GPS Tracking Data File provides the ground based Global Positioning System (GPS) receiver data, acquired from selected global GPS stations in the IGS network using the constellation of GPS navigation satellites. It is input to the Precision Orbit Determination software.

5.9.2 Content and Format

The contents of this file include:

- Time-ordered pseudorange and carrier phase from the GPS constellation of satellites.

A detailed file contents description is provided in Appendix A.

5.9.3 Source, Destination, and Transfer Method

This file will be initially obtained from the GPS Tracking Archive of the Crustal Dynamics Data and Information System (CDDIS) by the I-SIPS Team and stored on the UTGLAS SCF to be input to the precision orbit determination program.

5.9.4 Control Authority

Initially, the CDDIS is the control authority for the GPS Tracking Data File. The GLAS Science Team will be responsible for the integrity of the file while it is stored on the UTGLAS SCF.

5.9.5 Availability, Storage, and Retention

The I-SIPS Team will be responsible for retrieving the GLA ANC 10 file from the CDDIS. This file should be retrieved and available prior to executing the precision orbit determination process. The I-SIPS Team shall ensure the file is available for processing. The file should be available for the life of the GLAS investigation in case reprocessing is required.

5.10 Other Data (Miscellaneous) Files (GLA ANC 11)

5.10.1 Purpose

The Miscellaneous Data Files provide the parameters for support of the Precision Orbit Determination (POD) and Precision Attitude Determination (PAD) processes. The POD process requires gravity and tide models, lunar-solar-planetary ephemerides, and coordinates for the ground-based GPS and laser tracking sites. The PAD process requires a star catalog. The input data for POD and PAD are discussed in the POD and PAD Algorithm Theoretical Basis Documents, Information Documents 2.3g and 2.3h.

5.10.2 Content and Format

The contents of the files for POD support include:

- The real-time Earth Orientation Model -- IERS Terrestrial Reference Frame (ITRF) (updated only once per year).
  - Time-ordered precession parameters, per the IERS reference frame (1976 International Astronomical Union).
  - Time-ordered nutation parameters, per the IERS reference frame (1980 International Astronomical Union).

- ITRF coordinates for tracking stations, including the time rate of change.
- Gravity Field Model.
- Tide Models.
- Time-ordered Planetary Ephemerides.

The contents of the files for PAD support include:

- Celestial Reference Frame (CRF) Star Catalog and ties to CRF (updated infrequently).

Detailed contents and format descriptions for these files are provided in Appendix A.

5.10.3 Source, Destination, and Transfer Method

The initial source of the files will be the IERS via the Center for Space Research (CSR) at the University of Texas Austin.The files will be retrieved by the I-SIPS Team and stored on the UTGLAS SCF for precision orbit determination and precision attitude determination.

5.10.4 Control Authority

Initially, UTCSR will ensure the validity of the contents of the files. The GLAS Science Team will ensure the integrity of the files while they are stored on the UTGLAS SCF.

5.10.5 Availability, Storage, and Retention

The I-SIPS Team will be responsible for retrieving the GLA ANC 11 files from the UTSCR. These files should be retrieved and available prior to executing the precision orbit determination and precision attitude determination processes that requires their data for input. The I-SIPS Team shall ensure the files are available for processing. The files should be available for the life of the GLAS investigation in case re-processing is required.

5.11 Digital Elevation Model (GLA ANC 12)

5.11.1 Purpose

The Digital Elevation Model (DEM) provides the surface height above the mean ellipsoid.

5.11.2 Content and Format

Detailed contents and format descriptions for this file are provided in Appendix A.

5.11.3 Source, Destination, and Transfer Method

The source of the DEM is the GLAS Science Team. The DEM will be used on the ICESat SCF as input to the Level 1B elevation processor.

5.11.4 Control Authority

The GLAS Science Team is the control authority for the delivered DEM. The I-SIPS Team will ensure the integrity of the DEM while it is stored on the ICESat SCF.

5.11.5 Availability, Storage, and Retention

The I-SIPS Team will be responsible for retrieving the GLA ANC 12 file. This files should be retrieved and available prior to executing the Level 1B processes that requires this data for input. The I-SIPS Team shall ensure this file is available for processing. The file should be available for the life of the GLAS investigation in case re-processing is required.

5.12 Geoid File (GLA ANC 13)

5.12.1 Purpose

The Geoid file provides a grid of geoid heights that will be included on the elevation data products.

5.12.2 Content and Format

Detailed contents and format descriptions for this file are provided in Appendix A.

5.12.3 Source, Destination, and Transfer Method

The source of the Geoid is the GLAS Science Team. The Geoid will be used on the ICESat SCF as input to the Level 1B elevation processor.

5.12.4 Control Authority

The GLAS Science Team is the control authority for the delivered Geoid. The I-SIPS Team will ensure the integrity of the file while it is stored on the ICESat SCF.

5.12.5 Availability, Storage, and Retention

The I-SIPS Team will be responsible for retrieving the GLA ANC 13 file. This file should be retrieved and available prior to executing the Level 1B processes that requires this data for input. The I-SIPS Team shall ensure the Geoid file is available for processing. The file should be available for the life of the GLAS investigation in case re-processing is required.

5.13 Pole Tide Model File (GLA ANC 14)

5.13.1 Purpose

This file provides the model for corrections to the surface elevation based on the pole tide.

5.13.2 Content and Format

Detailed contents and format descriptions for this file are provided in Appendix A.

5.13.3 Source, Destination, and Transfer Method

The source of the Pole Tide Model is the GLAS Science Team. This file will be used on the ICESat SCF as input to the Level 1B elevation processor.

5.13.4 Control Authority

The GLAS Science Team is the control authority for the delivered Pole Tide Model. The I-SIPS Team will ensure the integrity of the file while it is stored on the ICESat SCF.

5.13.5 Availability, Storage, and Retention

The I-SIPS Team will be responsible for retrieving the GLA ANC 14 file. This file should be retrieved and available prior to executing the Level 1B processes that requires this data for input. The I-SIPS Team shall ensure this file is available for processing. The file should be available for the life of the GLAS investigation in case reprocessing is required.

5.14 Earth Tide Model File (GLA ANC 15)

5.14.1 Purpose

This file provides the model for corrections to the surface elevation based on the Earth tide.

5.14.2 Content and Format

Detailed contents and format descriptions for this file are provided in Appendix A.

5.14.3 Source, Destination, and Transfer Method

The source of the Earth Tide Model is the GLAS Science Team. This file will be used on the ICESat SCF as input to the Level 1B elevation processor.

5.14.4 Control Authority

The GLAS Science Team is the control authority for the delivered Earth Tide Model. The I-SIPS Team will ensure the integrity of the file while it is stored on the ICESat SCF.

5.14.5 Availability, Storage, and Retention

The I-SIPS Team will be responsible for retrieving the GLA ANC 15 file. This file should be retrieved and available prior to executing the Level 1B processes that requires this data for input. The I-SIPS Team shall ensure this file is available for processing. The file should be available for the life of the GLAS investigation in case reprocessing is required.

5.15 Load Tide Model File (GLA ANC 16)

5.15.1 Purpose

This file provides the model for corrections to the surface elevation based on the load tide.

5.15.2 Content and Format

Detailed contents and format descriptions for this file are provided in Appendix A.

5.15.3 Source, Destination, and Transfer Method

The source of the Load Tide Model is the GLAS Science Team. This file will be used on the ICESat SCF as input to the Level 1B elevation processor.

5.15.4 Control Authority

The GLAS Science Team is the control authority for the delivered Load Tide Model. The I-SIPS Team will ensure the integrity of the file while it is stored on the ICESat SCF.

5.15.5 Availability, Storage, and Retention

The I-SIPS Team will be responsible for retrieving the GLA ANC 16 file. This file should be retrieved and available prior to executing the Level 1B processes that requires this data for input. The I-SIPS Team shall ensure this file is available for processing. The file should be available for the life of the GLAS investigation in case reprocessing is required.

5.16 Ocean Tide Model File (GLA ANC 17)

5.16.1 Purpose

This file provides the model for corrections to the surface elevation based on the ocean tide.

5.16.2 Content and Format

Detailed contents and format descriptions for this file are provided in Appendix A.

5.16.3 Source, Destination, and Transfer Method

The source of the Ocean Tide Model is the GLAS Science Team. This file will be used on the ICESat SCF as input to the Level 1B elevation processor.

5.16.4 Control Authority

The GLAS Science Team is the control authority for the delivered Ocean Tide Model. The I-SIPS Team will ensure the integrity of the file while it is stored on the ICESat SCF.

5.16.5 Availability, Storage, and Retention

The I-SIPS Team will be responsible for retrieving the GLA ANC 17 file. This file should be retrieved and available prior to executing the Level 1B processes that requires this data for input. The I-SIPS Team shall ensure this file is available for processing. The file should be available for the life of the GLAS investigation in case reprocessing is required.

5.17 Surface Type Class File (GLA ANC 19)

5.17.1 Purpose

This file shall provide the 1 kilometer surface mask and surface type map.

5.17.2 Content and Format

For each revolution in an ICESat cycle this file contains the surface mask and type for 1 kilometer locations covered by the revolution. The surface mask indicates the surface (ice sheet, sea ice, land, or ocean) to be used to generate the Level 2 Elevation Products. One or more surfaces may be indicated by the mask for overlapping areas. The surface type, used by the Level 1B processes, indicates not only the four major surface type categories, but also variations within the categories. Detailed contents and format descriptions for this file are provided in Appendix A.

5.17.3 Source, Destination, and Transfer Method

The I-SIPS Team creates the Surface Type Class file from inputs provided by the GLAS Science Team. This file will be used on the ICESat SCF as input to the Level 1B processor that calculates the waveform based elevation corrections and the Level 2 processor that creates the surface specific elevation products.

5.17.4 Control Authority

The GLAS Science Team is the control authority for the Surface Type Class file. The I-SIPS Team will ensure the integrity of the file while it is stored on the ICESat SCF.

5.17.5 Availability, Storage, and Retention

The I-SIPS Team will be responsible for retrieving the GLA ANC 19 file. This file should be available prior to executing the Level 1B/2 processes that requires this data for input. The I-SIPS Team shall ensure this file is available for processing. The file should be available for the life of the GLAS investigation in case re-processing is required. Where necessary the input used to generate the GLA ANC 19 file will be archived at the ICESat SCF.

Section 6

Instrument Support Files

Instrument support files are those files required as input or created by the ISF Software. The Instrument Support file names and file ID are listed in Table 6-1 GLAS Instrument Support Data Products Volume and Frequency, along with file volume and frequency per day.

Table 6-1 GLAS Instrument Support Data Products Volume and Frequency

File ID	File Name	Volume (Mb)	Frequenc y per Day	Temporal Coverage
GLA SUP 01	GLAS Baseline Activity Plan	1.000	n/a	n/a
GLA SUP 02	Uplink and Downlink Schedules	1.000	n/a	n/a
GLA SUP 03	GLAS Housekeeping and Status Packets	1.000	n/a	n/a
GLA SUP 04	Instrument Command Blocks	1.000	n/a	n/a
GLA SUP 05	Spacecraft Command Sequences	1.000	n/a	n/a
GLA SUP 06	Predicted Events File	1.000	n/a	n/a
GLA SUP 07	Spacecraft Flight Operations Schedule	1.000	n/a	n/a
GLA SUP 08	Spacecraft Ephemeris Data Files	1.000	n/a	n/a
GLA SUP 09	Telemetry Data Requests	1.000	n/a	n/a
GLA SUP 10	Status Reports	1.000	n/a	n/a
GLA SUP 11	Instrument Performance Trend Files	1.000	n/a	n/a
GLA SUP 12	Event Log File	1.000	n/a	n/a
GLA SUP 13	GLAS Command Requests	1.000	n/a	n/a

n/a - Not applicable

For the support data, the initial control authority is the source or generating site - the control authority will ensure that the data is valid. Each of the support files is described in terms of: purpose, content, format, source, destination, transfer method, and control authority. The Instrument Operations Team (IOT) performs the routine operations associated with the ISF and the ISF Software.

6.1 GLAS Baseline Activity Plan (GLA SUP 01)

6.1.1 Purpose

The GLAS Baseline Activity Plan provides long range planning for instrument operation events.

6.1.2 Content and Format

TBD

6.1.3 Source, Destination, and Transfer Method

The GLAS Baseline Activity Plan (BAP) is produced by the Instrument Operations Team on the GLAS ISF. Inputs are provided by the Science Team. The BAP is delivered to the ICESat Mission Operations Center (MOC) and Flight Operations Team (FOT) to aid in spacecraft operations planning.

6.1.4 Control Authority

The Science Team is the control authority for this file.

6.1.5 Availability, Storage, and Retention

The availability of this file is TBD. The GLA SUP 01 file will be stored on the GLAS ISF and will be available for the entire mission + TBD years in order that instrument events can be traced to science plans.

6.2 Uplink and Downlink Schedules (GLA SUP 02)

6.2.1 Purpose

The Uplink and Downlink Schedules provide the IOT with the means to plan commanding and real time data monitoring events. The schedules will provide the open and close dates and times of uplink and downlink windows.

6.2.2 Content and Format

TBD

6.2.3 Source, Destination, and Transfer Method

The Uplink and Downlink Schedule is produced by the MOC. The IOT will retrieve the file using standard ESDIS Project tools and procedures and store on the GLAS ISF.

6.2.4 Control Authority

The MOC is the control authority for this file.

6.2.5 Availability, Storage, and Retention

The availability of this file is TBD. The GLA SUP 02 file will be stored on the GLAS ISF and will be archived when its applicability to operations is over.

6.3 GLAS Housekeeping and Status Packets (GLA SUP 03)

6.3.1 Purpose

The GLAS Housekeeping and Status Packets are used to monitor the health of the GLAS instrument.

6.3.2 Content and Format

TBD

6.3.3 Source, Destination, and Transfer Method

Real time packets are transmitted from the spacecraft to the ground via S-Band and delivered to the MOC from the ground station. Playback packets are delivered to the MOC from the EDOS. The IOT will retrieve the file from the MOC following required procedures and store on the GLAS ISF. The GLA SUP 03 file will be input into the ISF Software. The ISF Software will read the file and will display/report the health of the instrument. As requested, EDOS will deliver playback packets directly to the ISF.

6.3.4 Control Authority

The MOC is the control authority for this file prior to retrieval. Once on the ISF the IOT is the control authority.

6.3.5 Availability, Storage, and Retention

The availability of this file is TBD. The GLA SUP 03 file will be stored on the GLAS ISF and will be archived.

6.4 Instrument Command Blocks (GLA SUP 04)

6.4.1 Purpose

The Instrument Command Blocks are used to deliver GLAS instrument command blocks to the MOC. The command blocks are delivered once and stored by the MOC. The MOC uses the command blocks to build GLAS instrument commands to be uplinked to the spacecraft. As needed, the IOT will redeliver updated command blocks.

6.4.2 Content and Format

The content and format of the GLA SUP 04 file is dictated by the MOC. The instrument commands will be stored within this file.

6.4.3 Source, Destination, and Transfer Method

The command blocks are created by the IOT. The IOT delivers the files to the MOC using MOC specified procedures. The MOC stores the command blocks in the spacecraft command block table.

6.4.4 Control Authority

The IOT is the control authority for this file.

6.4.5 Availability, Storage, and Retention

The GLA SUP 04 files are created as required for mission operations. The command blocks will be stored on the GLAS ISF and remain available for the life of the mission + TBD years in order to trace instrument events.

6.5 Spacecraft Command Sequences (GLA SUP 05)

6.5.1 Purpose

The Spacecraft Command Sequences are reviewed by the IOT to ensure that the instrument commands are incorporated correctly into the sequence to be sent to the spacecraft.

6.5.2 Content and Format

The content and format of the GLA SUP 05 file is dictated by the ESDIS Project. The spacecraft and instrument commands and their timing information will be stored within this file.

6.5.3 Source, Destination, and Transfer Method

The command sequences are created by the FOT. The IOT retrieves the file from the MOC for review using MOC tools and procedures.

6.5.4 Control Authority

The FOT is the control authority for this file.

6.5.5 Availability, Storage, and Retention

The GLA SUP 05 files are created as required for mission operations. The files will be stored on the GLAS ISF and remain available for the life of the mission + TBD years in order to trace spacecraft and instrument events.

6.6 Predicted Events Files (GLA SUP 06)

6.6.1 Purpose

The Predicted Events Files are reviewed by the IOT to ensure that the instrument commands were timed correctly in the command sequences. The Predicted Events Files are also used to see timing of spacecraft events.

6.6.2 Content and Format

The content and format of the GLA SUP 06 file is dictated by the ESDIS Project.

6.6.3 Source, Destination, and Transfer Method

The predicted events files are created by the FOT. The IOT retrieves the file from the MOC for review using ESDIS tools and procedures.

6.6.4 Control Authority

The FOT is the control authority for this file.

6.6.5 Availability, Storage, and Retention

The GLA SUP 06 files are created as required for mission operations. The files will be stored on the GLAS ISF and remain available for the life of the mission + TBD years in order to trace spacecraft and instrument events.

6.7 Spacecraft Flight Operations Schedule (GLA SUP 07)

6.7.1 Purpose

The Spacecraft Flight Operations Schedule are utilized by the IOT to see the timing of spacecraft events and to plan future instrument events.

6.7.2 Content and Format

The content and format of the GLA SUP 07 file is dictated by the ESDIS Project.

6.7.3 Source, Destination, and Transfer Method

The spacecraft flight operations schedules are created by the FOT. The IOT retrieves the file from the MOC for review using ESDIS tools and procedures.

6.7.4 Control Authority

The FOT is the control authority for this file.

6.7.5 Availability, Storage, and Retention

The GLA SUP 07 files are created as required for mission operations. The files will be stored on the GLAS ISF and remain available for the life of the mission + TBD years in order to trace spacecraft and instrument events.

6.8 Spacecraft Ephemeris Data Files (GLA SUP 08)

6.8.1 Purpose

The IOT uses the Spacecraft Ephemeris Data Files to see predicted and past orbit events.

6.8.2 Content and Format

The content and format of the GLA SUP 08 files is dictated by the ESDIS Project. These files will contain predicted and actual events.

6.8.3 Source, Destination, and Transfer Method

The GLA SUP 08 files are created by the FOT. The IOT retrieves the file from the MOC for review using ESDIS tools and procedures. The files will be transferred to the ICE-Sat SCF using standard UNIX tools and will be available to the GLAS Science Team and ISIPS Team.

6.8.4 Control Authority

The FOT is the control authority for this file.

6.8.5 Availability, Storage, and Retention

The GLA SUP 08 files will be created on a regular basis as defined by the ESDIS. The files will be stored on the ICESat SCF and remain available for the life of the mission + TBD years in order to trace events and to satisfy any reprocessing needs.

6.9 Telemetry Data Requests (GLA SUP 09)

6.9.1 Purpose

The IOT uses the Telemetry Data Requests to retrieve additional real time spacecraft and instrument data as necessary.

6.9.2 Content and Format

The content and format of the GLA SUP 08 files is dictated by the ESDIS Project. The contents of these files include the type of data to retrieve and the requested time span of the data.

6.9.3 Source, Destination, and Transfer Method

The GLA SUP 09 files are created by the IOT. The files are input to the ISF Software. The Telemetry Data Query Files remain on the ISF.

6.9.4 Control Authority

The IOT is the control authority for individual instances of the files. The ESDIS is the control authority for the format and required contents.

6.9.5 Availability, Storage, and Retention

The GLA SUP 09 files will be created (or updated) when it is necessary to retrieve telemetry data. Each instance of the files may not be retained, however templates and example files will be available.

6.10 Status Reports (GLA SUP 10)

6.10.1 Purpose

The Status Reports provide instrument health and performance data. The Status Reports convey any instrument problems.

6.10.2 Content and Format

The content and format of the GLA SUP 10 files is dictated by the ESDIS Project and the GLAS Science and Instrument Teams. These files may include general status and instrument performance information, problems, temperature and power data, events during the reporting period, and future events.

6.10.3 Source, Destination, and Transfer Method

The GLA SUP 10 files are created by the IOT. The IOT delivers the file to the FOT using ESDIS tools and procedures. The Status Reports are also delivered to the GLAS Instrument and Science Teams via a TBD method.

6.10.4 Control Authority

The IOT is the control authority for this file.

6.10.5 Availability, Storage, and Retention

The GLA SUP 10 files will be created on a regular basis as defined by the ESDIS and the GLAS Science and Instrument Teams. The files will be stored on the ISF and remain available for the life of the mission + TBD years.

6.11 Instrument Performance Trend Files (GLA SUP 11)

6.11.1 Purpose

The Instrument Performance Trend Files are used by the IOT and the Science and Instrument Teams to monitor and analyze the performance of the GLAS instrument over the mission.

6.11.2 Content and Format

The content of the GLA SUP 11 files is dictated by the GLAS Science and Instrument Teams and is TBD. These files will include instrument status data, temperature and power data, and time.

6.11.3 Source, Destination, and Transfer Method

The GLA SUP 11 files are created by the ISF Software. The IOT delivers the file to the Science and Instrument Teams for their review.

6.11.4 Control Authority

The IOT is the control authority for this file.

6.11.5 Availability, Storage, and Retention

The GLA SUP 11 files will be created and updated on a regular basis as defined by the Science and Instrument Teams. The files will be stored on the ISF and remain available for the life of the mission + TBD years.

6.12 Event Log File (GLA SUP 12)

6.12.1 Purpose

The Event Log File contains the list of actual spacecraft events including the list of commands radiated to the spacecraft and their timing. The file is used by the IOT to determine whether the GLAS instrument commands were radiated to the spacecraft and the timing of the radiation. The IOT will also use the file to see the timing of actual spacecraft events.

6.12.2 Content and Format

The content and format of the GLA SUP 12 files is dictated by the ESDIS and is TBD.

6.12.3 Source, Destination, and Transfer Method

The GLA SUP 12 files are created by the FOT. The IOT retrieves the file from the MOC for review using ESDIS tools and procedures.

6.12.4 Control Authority

The FOT is the control authority for this file.

6.12.5 Availability, Storage, and Retention

The GLA SUP12 files are created as required for mission operations. The files will be stored on the GLAS ISF and remain available for the life of the mission + TBD years in order to trace spacecraft and instrument events.

6.13 GLAS Command Requests (GLA SUP 13)

6.13.1 Purpose

The GLAS Command Request file contains GLAS command requests to be sent to the FOT. In this file the IOT specifies the command block(s) requested for radiation to the spacecraft and their timing.

6.13.2 Content and Format

The content and format of the GLA SUP 13 file is dictated by the ESDIS Project. The requested instrument command blocks and their timing information will be stored within this file.

6.13.3 Source, Destination, and Transfer Method

The command requests are created on the GLAS ISF by the IOT. The IOT delivers the file to the MOC for expansion into a command sequence for uplink to the spacecraft.

6.13.4 Control Authority

The IOT is the control authority for this file.

6.13.5 Availability, Storage, and Retention

The GLA SUP 13 files are created as required for mission operations. The command requests will be stored on the GLAS ISF and remain available for the life of the mission + TBD years in order to trace instrument events.

Appendix A
File Formats

Table A-1 Content and Format of the Meteorological Data File (GLA ANC 01)

To Be Provided

Table A-2 Content and Format of the Laser Tracking Data File (GLA ANC 03)

To Be Provided

Table A-3 Content and Format of the IERS Polar Motion and Earth Rotation Data File (GLA ANC 04)

To Be Provided

Table A-4 Content and Format of the Magnetic and Solar Flux Data File (GLA ANC 05)

To Be Provided

Table A-5 Content and Format of the GLAS Metadata and Data Product Quality Data File (GLA ANC 06)

To Be Provided

Table A-6 Content and Format of the GLAS Coefficients and Constants ESDIS File (GLA ANC 07)

To Be Provided

Table A-7 Content and Format of the Precision Orbit Data File (GLA ANC 08)

To Be Provided

Table A-8 Content and Format of the Precision Attitude Data File (GLA ANC 09)

To Be Provided

Table A-9 Content and Format of the GPS Tracking Data File (GLA ANC 10)

Receiver Independent Exchange (RINEX) Format

Table A-10 Content and Format of the Miscellaneous Data File (GLA ANC 11)

To Be Provided

Table A-11 Content and Format of the Digital Elevation Model File (GLA ANC 12)

To Be Provided

Table A-12 Content and Format of the Geoid File (GLA ANC 13)

To Be Provided

Table A-13 Content and Format of the Pole Tide Model File (GLA ANC 14)

To Be Provided

Table A-14 Content and Format of the Earth Tide Model File (GLA ANC 15)

To Be Provided

Table A-15 Content and Format of the Load Tide Model File (GLA ANC 16)

To Be Provided

Table A-16 Content and Format of the Ocean Tide Model File (GLA ANC 17)

To Be Provided

Table A-17 Content and Format of the Surface Type Class File (GLA ANC 19)

To Be Provided

Abbreviations & Acronyms

ALT	EOS-Altimeter spacecraft series
APID	Application Process Identifier
ATBD	Algorithm Theoretical Basis Document
CCSDS	Consultative Committee for Space Data Systems
CDDIS	Crustal Dynamics Data and Information System
CMDL	Climate Monitoring and Diagnostics Laboratory
CRF	Celestial Reference Frame
CSR	Center for Space Research at the University of Texas
DAAC	Distributed Active Archive Center
ECS	EOSDIS Core System
EDOS	EOS Data and Operations System
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
EPGS	EOS Polar Ground Station
ESDIS	Earth Science Data and Information System
FOT	Flight Operations Team
GDS	GLAS Ground Data System
GLAS	Geoscience Laser Altimeter System
GPS	Global Positioning System
GSFC	NASA Goddard Space Flight Center at Greenbelt, Maryland
GSFC/WFF	NASA Goddard Space Flight Center/Wallops Flight Facility at Wallops Island, Virginia
HDF	Hierarchical Data Format
ICESat	Ice, Cloud, and Land Elevation Satellite
ID	Identification
IEEE	Institute for Electronics and Electrical Engineering
IERS	International Earth Rotation Service
IGS	International GPS Service for Geodynamics
IOT	Instrument Operations Team
ISF	GLAS Instrument Support Facility

ITRF	IERS Terrestrial Reference Frame
LASER	Light Amplification by Stimulated Emission of Radiation
LIDAR	Light Detection and Ranging
MOC	Mission Operations Center
N/A	Not (/) Applicable
n/a	Not (/) Available
NASA	National Aeronautics and Space Administration
NCEP	National Centers for Environmental Prediction
NOAA	National Oceanic and Atmospheric Administration
NSIDC	National Snow and Ice Data Center (DAAC)
PAD	Precision Attitude Determination
PDS	Production Data Set
POD	Precision Orbit Determination
QA	Quality Assurance
RINEX	Receiver Independent Exchange
SCF	GLAS investigation Science Computing Facility and workstation(s)
SDPS	Science Data Processing Segment
SPSO	EOS Science Project Support Office
ST	Science Team
TBD	to be determined, to be done, or to be developed
UNIX	the operating system jointly developed by the AT&T Bell Laboratories and the University of California-Berkeley System Division

Glossary

file	A collection of data stored as records and terminated by a physical or logical end-of-file (EOF) marker. The term usually applies to the collection within a storage device or storage media such as a disk file or a tape file. Loosely employed it is used to indicate a collection of GLAS data records without a standard label.
header	A text and/or binary label or information record, record set, or block, prefacing a data record, record set, or a file. A header usually contains identifying or descriptive information, and may sometimes be embedded within a record rather than attached as a prefix.
label	The text and/or binary information records, record set, block, header, or headers prefacing a data file or linked to a data file sufficient to form a labeled data product. A standard label may imply a standard data product. A label may consist of a single header as well as multiple headers and markers depending on the defining authority.
Level 0	The level designation applied to an EOS data product that consists of raw instrument data, recorded at the original resolution, in time order, with any duplicate or redundant data packets removed.
Level 1A	The level designation applied to an EOS data product that consists of reconstructed, unprocessed Level 0 instrument data, recorded at the full resolution with time referenced data records, in time order. The data are annotated with ancillary information including radiometric and geometric calibration coefficients. The included, computed coefficients and parameter data have not however been applied to correct the Level 0 instrument data contents.
Level 1B	The level designation applied to an EOS data product that consists of Level 1A data that have been radiometrically corrected, and processed from raw data into sensor data units.
Level 2	The level designation applied to an EOS data product that consists of derived geophysical data values, recorded at the same resolution and time order as the Level 1A or Level 1B data, and includes georeference location from the precision orbit.
Level 3	The level designation applied to an EOS data product that consists of geophysical data values derived from Level 1 or Level 2 data, recorded at a temporally or spatially re-sampled resolution.
Level 4	The level designation applied to an EOS data product that consists of data from modeled output or resultant analysis of lower level data that are not directly derived by the GLAS instrument and supplemental sensors.
metadata	The textual information supplied as supplemental, descriptive information to a data product. It may consist of fixed or variable length records of ASCII data describing files, records, parameters, elements, items, formats, etc., that may serve as catalog, data base, keyword/value, header, or label data. This data may be parsable and searchable by some tool or utility program.

product	Specifically, the Data Product or the EOS Data Product. A GLAS data product refers to the data file or record collection either prefaced with a product label or standard formatted data label or linked to a product label or standard formatted data label file. Loosely used, it may indicate a single pass file aggregation, or the entire set of product files contained in a data repository.
record	A specific organization or aggregate of data items. It represents the collection of EOS Data Parameters within a given time interval, such as a one-second data record. It is the first level decomposition of a product file.
Standard Data Product	Specifically, a GLAS Standard Data Product. It represents an EOS ICESat GLAS Data Product produced within the GLAS Science Computing Facility using EOS science community approved algorithms. It is routinely produced and is intended to be archived in the DAAC data repository for EOS user community-wide access and retrieval.